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San Francisco, California
1950

THE PAN-PACIFIC ENTOMOLOGIST

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The Pan-Pacific Entomologist

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THE ROLE OF THE ENTOMOLOGICAL MUSEUM[1]

BY EDWARD S. ROSS

California Academy of Sciences
San Francisco, California

Before the turn of the Century, entomology was indeed a minor science compared with what it is today. What there was of it was largely limited to the field of taxonomy. There was no such thing as a professional systematist. Most systematic entomology was practiced as an avocation chiefly by physicians and clergymen. Museums were still relatively small, means of communication were poor, and most published work was based on private collections. Gradually these private collections found their way into museums. Museums gained financial support, sponsored expeditions, employed larger staffs, and ever added to the accumulation of research material.

More recently, coupled with the impetus of economic entomology, the museum is evolving into something new. There is an increasing number of trained professional systematists and skilled amateurs. Many of these have found it unnecessary to build large private collections but have come to depend on the museum as a source of research material. With modern service, the greatest utilization of museum specimens is now through use of the mails. The museum is becoming a concentration point and a mail order house for insects and the curator, an experienced shipping clerk whose diet is constantly supplemented by the glue of postage stamps and address stickers.

As one of these well-nourished, label-licking curators, I should like to take this opportunity to define some of the various functions of the entomological museum and to discuss some of its problems as I see them.

[1]Retiring presidential address read before the 208th meeting of the Pacific Coast Entomological Society, December 3, 1949. The views expressed in this paper are those of the author and do not necessarily reflect those of this Society or of the California Academy of Sciences.

First of all, we might note that museums and libraries have much in common; in fact, a library might be considered but a kind of museum. Beyond their constant current use, museums and libraries together comprise the link of knowledge between past and present generations and those of the future. Libraries preserve for future reference man's published data and ideas. Museums, whether dealing with the arts, history, or the sciences, preserve samples of his material things. In systematic biology, at least, there exists a very important bond between libraries and museums for it is usually possible to find lodged in some museum the very specimens upon which publication has been based. Since the all-important need for checking conclusions developed in the fields of morphology, physiology, the applied sciences, etc., is dependent upon a common denominator of identification, it follows that almost all branches of biology owe a debt to the museum; the checking point for these vital identifications.

The need for active museums in any field of biology varies directly with the degree of stability of its nomenclature, and the quality of its monographs. When any taxonomic group has been thoroughly sampled geographically, and when the type upon which each proposed name is based has been expertly studied, the importance of specimens in museums diminishes. It is not surprising that the value of a museum specimen viewed in this light decreases with the increased size of the species. For example, many will admit that the museum phase in the fields of mammalogy and ornithology is over. Thanks to a rather stable nomenclature, these sciences are now well along with more interpretive studies. For this reason it is surprising that most museums still have mammalogy and ornithology departments about as well staffed as ever whereas support for departments dealing with certain smaller forms of life is often non-existent.

Although we have been at it a long time, the museum phase of entomology is now hardly underway. The systematics of insects, even that of groups having great economic importance, is far from settled. This has often resulted in an unfortunate frequency of name changing and much criticism of systematists, especially by those engaged with applied problems. Beyond the ever-present human factor, much of the difficulty has been due to a failure to study available museum types and series. One might add also the common tendency to rely too much on what

is in museums with a resultant disregard of biology. Reference to what is available in museums is, of course, not as easily had as the uninitiated might expect. Types, if indeed extant, are scattered in museums all over the world and it is a costly and time consuming matter to see them all. Nevertheless, we must rely on the museum to preserve such material at least until all the problems of nomenclature have been settled.

In thus preserving and making available for use the specimens upon which the literature is based the museum performs one of its most important functions; namely, that of being a place where collections can be received, curated, and preserved for future reference.

Another important function of a museum is to act as a concentration point for unstudied specimens—the "raw material" of taxonomic research. A good part of such "raw material", of course, represents an assemblage of the unstudied portions of private collections. The major and most intriguing part, however, results from field expeditions sponsored by the museum. Any enthusiastic systematist eagerly scans such fresh accumulations because the thrill of new discoveries and vistas of new concepts is often his reward. When a museum fails to gather new material it is as dead and as unproductive as a machine without fuel.

I do not wish to imply that all new specimens are immediately studied. Any museum possesses vast assemblages of unstudied specimens. These need not be a cause for alarm. Entomology is far too extensive a field to have specialists studying all groups during any single period. In fact, many categories as high as the family level haven't yet had any serious attention. Sooner or later, however, someone will appreciate the fact that specimens have been stockpiled for his use in museums. He will thus be able to base his work at a much higher level than privately possible, see specimens from regions he may never personally hope to visit, and arrive at sounder taxonomic conclusions that could only result from an analysis of the maximum amount of data.

Museums go to considerable expense and labor in building up these materials for taxonomic research. It is the duty of the specialist to use this material in his work. Before publishing a

paper purporting to be a revision of a group, the worker should always ask himself, "Is this paper as complete as reference to all available accumulations in museums would render it?" If not, the worker would be committing one of the crimes of science in taking up precious publication space with conclusions that are not based on analysis of all data.

This brings us to the subject of the means of using museum facilities. All museums, of course, attempt to have table space and equipment for visiting scientists. Most often this is the only manner in which types may be studied. Obviously, however, it is impossible for a specialist personally to visit each museum in the course of a given taxonomic project. The only recourse is the ever-increasing practice of borrowing specimens through the mails. In this manner a worker can have before him at one time the often vast reservoir of specimens available in museums. Curators, because of pressure of other work, or a fear of losing specimens, unfortunately are not always eager to fill loan requests. They should realize, however, that it is one of their primary duties to honor any loan request made by a worker in good standing, or who is properly recommended. Unstudied specimens lying idle in museums at a time when revisionary work is being done might just as well be back in the field if they are not utilized during such fleeting periods of activity.

The worker on his part should realize that there are certain limits to a reasonable loan request. In general, curators dislike packing up large portions of collections that have been placed in definitive arrangement following more or less recent study by a recognized worker. In these cases requests should be limited to certain critical species. The worker should never expect to retain duplicates from series correctly identified by others except on an exchange basis. Certain collections, such as those of Leconte, Horn, and Casey, upon which a tremendous amount of nomenclature has been based, should never be freely loaned at least until the types or type series have been recognized and separated. Any portions of such collections that have not been mentioned in the literature need not be treated with such reverence.

In all the hundreds of loans this Academy has granted, we have had no losses in transport even in shipments to foreign countries. Any damage enroute has usually been due to improper packing rather than to rough handling. In spite of this, museums

do suffer some abuses, but these are so rare that they should not be an excuse for a discontinuance of the lending of specimens. Occasionally, though rarely, we have been unable to secure a return of loaned specimens. In some cases excessive series of duplicates, often the best specimens, have been retained in spite of the fact that workers should strive, for the good of all, to build up institutional collections rather than to reduce them. Most of the abuse, however, centers around the desire to possess holotypes. Much of this is legal but often borders on the unethical. I might cite one example passed on to me by my predecessor, Mr. Van Duzee. In this case a worker, having borrowed a few thousand unstudied western representatives of a family, discovered that a large number of new species were represented. Unfortunately for him, the types would have to be returned to this Academy. What did he do? He used the borrowed collection as an itinerary source for a very fruitful field trip. By visiting each of the potential type localities at the season indicated on our labels, he was able to secure and designate his own specimens as holotypes.

Abuses of the loaning privilege are more than offset by the contributions to science and the museum that result. The lending museum benefits by being able to make available to local workers authoritatively identified reference material enhanced in significance by mention in the literature. Most specialists will also try to fill in gaps in institutional collections with duplicates of needed species from their own collection.

Another function of a museum is to be a "specialist." Most museums are unavoidably regional in scope. They naturally tend to have the best collections from the areas in which they are located and workers elsewhere tend to depend upon them as sources for collections from such regions. There is also a desirable tendency to explore certain adjacent foreign regions that are faunistically related. Thus, for example, this Academy is a recognized source of research material from Western North America but has also developed large accumulations from North Western Mexico, Alaska, and the islands and shores of the Pacific.

Another form of museum specialty results from the research inclinations of its staff. The resultant development of outstanding collections in a taxonomic group is a desirable and an essential step toward making real published contributions. It is undesirable,

however, for curators of any period to decide that their institution will cease to build up collections of other groups. This can even be aggravated by such curators using existing general collections as exchange material to augment their specialized collections. Such taxonomic specialization is, however, quite admissable in cases where a broad, general collection is being actively maintained nearby by another institution.

A further function of many museums is to have a representative set of insects from a world standpoint. It is becoming increasingly evident that it is impossible to study intelligently any local fauna without a broad knowledge of genera from a world, but more particularly a European, standpoint. In many Orders higher categories have been very incompletely correlated from a world standpoint. There is a need for first hand examination, not a mere literature knowledge, of the type species upon which these categories are based. A good deal of the frequent changing of name combinations has been due to a tendency of certain workers to know only a limited fauna. As we study northward on our continent the need becomes more and more urgent to know the Palaearctic fauna. As we proceed southward, a knowledge of the Neotropical becomes indispensable. To fill this need with limited funds and staff is one of the challenging problems of our museums.

The educational function of entomological museums associated with universities is obvious. The separately maintained museum, however, has an opportunity to be of much broader service. Whereas the services of a university museum must of necessity be more or less limited to registered students and staff, the independent museum spreads its influence to all age groups. Very often it is the only place where youth, the post-university-age amateur, and the professional entomologist can find the means for pursuing his work. We take pride here at the Academy in the number of young people who profit by our efforts. Many have gone on into professional entomology, others continue as enthusiastic amateurs. Avocational entomology can add to the fullness of many a life and this fact alone could well justify the place of museums in our society.

A well balanced public museum should also provide adequate exhibits in the field of entomology. These should emphasize the local fauna and answer common questions.

So far I have tried to analyze some of the functions of the entomological museum. At this time attention might be given to some of its problems.

The major problem is that financial support of the activity is more in proportion to the size of the organisms involved than to the size of the job. Most museums receive material faster than it can be assimilated. The chief bottle neck is the lack of sufficient cases and drawers to arrange identified collections and thus make room for new material. Added to this is the lack of sufficient staff.

These shortages, it appears, all stem from the fact that museum activity, like that of a library, is very unspectacular. It fails to arouse the interest of the general public who these days is constantly being steeped in publicity about some new insecticide, antibiotic, advances in atomic and medical research, etc. Money today comes to the institution that is well promoted and has something understandable to promote. It is in the field of expeditions that the greatest chance for money drawing publicity can develop but here, unfortunately, the most fruitful collecting trips are simple, plodding affairs. The participants must return bearing a tale of a narrow escape from the embrace of a boa constrictor to attract much attention.

Most museums, to be truly scientific, tend to collect objectively all insects regardless of any known economic significance. Because only a very small percentage of the vast insect world directly affects man's welfare, it follows that a proportionately small percentage of museum activity can be justified on economic grounds. There is, however, great cultural value in objectively knowing the inhabitants of this planet, their habits and distribution. Our alternative is to remain ignorant of such things and this is unthinkable. This is a difficult idea, however, to get over to a materialistically minded public and the various legislative bodies controlling appropriations. No one seems to demand an economic return from certain other cultural pursuits of man such as his art and music but when it comes to science, the public has been educated to expect immediate and tangible returns. This situation is often aggravated in the privately endowed museum which is free from the pressure of the tax payer. Here there is a tendency to engage purposefully in research that has no eco-

nomic bearing. This, although almost suicidal, is as it should be. Work on insect groups having economic importance can be well justified in tax-supported institutions. If the worker in the private museum clamors to work in these fields too, who will be left to study the non-economic groups which constitute the bulk of the insect world?

With the steady decrease in private fortunes, the hope is not too good for any great increase in financial support for the needed expansion of independent museums wherein most of the major insect collections are lodged. With this in mind, systematists should perhaps search for ways in which they can work more efficiently under existing conditions.

Undoubtedly the greatest single boon to progress would be a relaxation of institutionalism and individualism in regard to types. In this country, at least, types are so woefully scattered and often so poorly curated that many workers try to get along without reference to them. This often results in errors that might well have been avoided. With so much work to be done and so few to do it, we cannot afford to have to continually go back to correct errors. Every revision should have its nomenclature firmly fixed by reference to types.

Is it not too much to hope for a central institution whose function is to concentrate types or information about types? This would mean a pooling of all available types in this country in one safe place. Workers could then, in a relatively short time and a limited journey, speed their work immeasurably and be able to accomplish more in a lifetime. Space in journals would be more efficiently used, concepts of species would be less provisional, and the value of each publication would be more lasting.

Such an institution could be built around a file covering the citation, data, and institutional location of the type, or potential lectotype, for every name proposed for insects and their relatives. This file would be of great value in itself but the ideal objective, (of course unobtainable) would be to possess a type specimen for every name. It might be possible to exchange types of exotic species present in American museums for types of American species deposited abroad. This, of course, would not be so vital in cases where types of a given group are already concentrated in one institution. In cases where types cannot be obtained, each

worker who goes abroad to see them could contribute compared specimens together with copies of his notes, drawings, and photographs. In many of the older collections, of course, types are not yet clearly determined. Such types would not be separated from the parent collection until they have been clearly worked out by a good specialist. Workers actively engaged in continuous research in a group would be permitted temporarily to hold the types they create as long as they are needed. A policy of making publication of a new name in a journal contingent on such eventual deposit would not be unreasonable. If a worker expects the world to recognize his new name, he should willingly place its type where it is available to all.

I am sure the immediate reaction of many curators to this proposal will be one of horror, but most of this horror I believe would be based on unscientific selfish reasons. *It is not the purpose of types to make an institutional or private collection valuable or indispensable.* Admittedly it would mean that some museums would give up more than others. As matters stand, however, no institution is self-sufficient in regard to types and all stand to gain in the long run. What is really important is that our ponderous science would advance more rapidly with unwavering, steady steps.

The question immediately arises as to the location of this depository. I am sure that the authorities of the United States National Museum would feel that theirs is the logical place. This might be so if the National Museum was itself logically located. But in this day we have very little assurance that Washington, D.C. will not be a prime target in a future war and as long as there is even a remote danger of such an unfortunate happening, it, or any similar potential target area, is not the place for a museum. Furthermore, the climate of Washington, D.C. is far from stimulating during the summer months when most workers are free to study types.

I really didn't intend to start a discourse on the location of the National Museum, but now that I have, I might as well state my opinion. This highly important national collection deserves a much better deal than it is getting. A country as rich as this should be well able to quarter and staff this worthy activity under much better circumstances. Anyone who has recently visited this

museum and has noted the crowded research conditions in Entomology well knows of what I speak.

There is no good reason why the exhibit and research functions of the National Museum, or any other museum for that matter, need be in the same building or vicinity. The exhibits could take over the entire present structure and the research activity should be given a separate, specially designed building with ample space for expansion and for visiting workers. Most of all, since a fresh start is already needed and a move must be made, it should be moved to some smaller, non-industrial community with a good climate and a pleasant natural history environment. Under such conditions I am sure that the health of that rare species, the museum systematist, would be improved and he would spend much less time and energy in getting between his home and his desk.

Many will propose that this dream institution should remain on the Atlantic seaboard. Actually, however, the West and Middlewest are growing and there is a strong case for a more central location. There are already a number of large museums along the Atlantic Coast and the moving of the National collections would not leave too great a void for workers in that region. The identification service of the Department of Agriculture would benefit by shorter mailing distances as well. Should the National collections be adequately housed and more favorably located, I am sure that many workers would favor the concentration of all types in that collection. Such types should, of course, be housed in special rooms and there should be a provision for a permanent and adequate staff to care for them. The problem of past commitments regarding the permanent ownership of types in the various museums might be overcome by the use of indefinite loans. The policies and management could be under the surveillance of a democratically selected board of curators representing the various institutions contributing to the pool.

The Pacific Coast for many years has had, with minor exceptions, such a central type depository here at the California Academy of Sciences. The present proposal is merely to extend this principle to a National scale.

Perhaps this idea is too visionary and, because of man's inherent selfish nature, may never be put into effect. It would be interesting, however, to hear the reactions of systematists.

DESCRIPTIONS OF NEW SPECIES OF STAGBEETLES FROM FORMOSA AND THE PHILIPPINES

(Coleoptera: Lucanidae)

BY BERNARD BENESH

North Chicago, Illinois

A selected lot of Lucanidae of doubtful status, secured as a loan from the California Academy of Sciences, reveals, after a protracted study by me and comparison by the late Dr. Gilbert J. Arrow with material in the British Museum (Natural History), that it contains no less than twelve species, of which number six are new to entomological science, whilst the others indicate new localities, thus adding to their recorded ranges. The species are members of the lucanid subfamilies DORCINAE and FIGULINAE, and represent just a fraction of the stagbeetles collected by Fred C. Hadden in the Philippines, and J. Linsley Gressitt in Formosa. They are described in subjoined diagnoses, including also the description of a new Philippine species of *Aegus* from my personal collection. To complete the description of one species (*Dorcus gracilicornis*), of which only the male sex was represented in the lot, the writer has drawn on his private collection. Unless otherwise noted the determinations are mine.

I wish to express my gratitude to the entire entomological staff of the Academy, who were of material assistance during my brief visit, especially to Drs. Edwin C. Van Dyke, Edward S. Ross, and last, but not least, to Hugh B. Leech, who graciously permitted the use of his private binocular microscope. My thanks are due also to Mr. Rupert L. Wenzel, Chicago Natural History Museum for correction of this contribution.

The species are diagnosed as follows:

Subfamily DORCINAE

Genus DORCUS Megerle (Nomen catalogum)

The Antelope stagbeetles

MacLeay, Horae Ent., 1:111, 1819.

Dorcus gracilicornis Benesh, new species

Figures* 3, ♂, 4, 4a, ♀.

Male. Head transverse, broader than long, declivous in front, finely granulate throughout, of satiny aspect, anterior half and

*Illustrations to appear in next issue.

around the eyes remotely shallowly punctured, subopaque. Anterior angles obtuse, thence diverging diagonally to the canthus, which is parallel and half way encompasses the eye; postocular section slightly produced. Clypeus produced, broad, truncate. Anteocular bosses prominent, with an elongate fovea. Mandibles falciform, granulate, flattened on top, laterally rounded, and with a small sub-median, inwardly directed acute, prong-like, tooth. Eyes oblong, facetted, marbled, parallel. Antennae of ten segments, dark reddish-brown, glabrous; scape nearly black, nitid, and as long as the funicle and clava combined; funicle slightly longer than the clava, funicular segments highly polished and strongly shining; clava three-segmented with first and second segment lobate, their bases glabrous and nitid, third circular in outline, depressed, wholly pubescent, the pubescence ash-gray.

Pronotum transverse, depressed, anterior margin sinuate, center produced; anterior angles subacute, extending well beyond the produced center; sides gently broadening from apex to basal third, where there is a distinct acumination, thence diagonally arcuate to basal angles, the latter broadly rounded; base straight. Anterior margin paralleled by an impressed line; anterior angles, lateral and basal margins punctured; disk granulate throughout and more shining than the head.

Scutellum heart-shaped, punctured, depressed (on a lower plane than the elytra). Elytra parallel, narrower at base, slightly attenuate posteriorly, black with a reddish tinge, nitid; humeri feebly produced to front, simple (not mucronate); basal area strongly rugose (as in *D. glabripennis*), suture paralleled by a punctate stria; between sutural stria and lateral declivity the elytra are uneven by ill-defined striae; margins punctate striate, posterior irregularly punctate.

Legs moderate. Anterior tibiae strongly furcate, furcation downward bent, followed by three unequal, equidistant teeth; between furcation and distal spur (above the tarsus) with a tuft of golden setae; upper area ridged, setose in fissures; outer margin fringed by long, unequal, golden setae. Intermediate and posterior tibiae armed in distal half with a single spine, and linearly setose. Tarsi as long as the tibiae, black, excepting the praetarsus, which is reddish-brown, glabrous dorsad and strongly shining, fasciculate setose ventrad; praetarsus as long as the other four segments of tarsus combined. Lower margin of anterior, and hind margin of intermediate and posterior femora setose.

Beneath black, excepting the palpi, anterior margin of prosternum, margins of coxal cavities, geniculation of legs, and inflexed portion of the elytra, which are cherry-red. Mentum transverse, granulate, sculptured by large, confluent crescent-shaped and irregular punctures; anterior margin feebly emarginate, lateral angles obtuse. Genae, prosternal and metasternal episternum strongly punctured; lateral area of metasternum pilose. Ventral

segments finely punctured; margin of fifth (terminal) segment fringed with long golden setae.

Female. Head transverse, black, nitid, rather large in proportion to the rest of the body, slightly narrower than the prothorax, rugosely sculptured by irregular large punctures; vertex bituberculate in line with the eyes; occiput impunctate; anterior margin nearly straight; clypeus produced and bilobate in front, diverging towards the base; anterior angles very feebly arcuate, diagonal to canthus, the latter gently dilated and halfway circumscribing the eye; cheek slightly produced, thence converging to base; eyes oblong, simple, slanting; mandibles slender, acute, trigonate in cross section, carinate laterally, outer margin nearly perpendicular, top elevated in center, forming an oblongo-conical node; inner margin armed with an inwardly directed tooth, this simple on right mandible, slightly exised posteriorly on left, thus forming a supplementary denticle. Antennae dark piceous, glabrous, excepting the sixth and seventh segments which bear golden setae posteriorly; clava clothed with ashy-gray pubescence. Scape equal in length to funicle and clava, club-shaped, feebly bent at middle. Funicle slightly longer than the clava, first funicular segment pyriform; second to fifth with base narrower and progressively dilated apically, their apices square, sixth as the preceding but diagonally truncate. Clava three-segmented, first and second segments lobate, pubescent, their bases apically glabrous and nitid; third segment circular, flattened, pubescent throughout.

Prothorax convex, quadrangular, dark chocolate-brown, nitid, anterior margin sinuate, fringed with short golden setae and paralleled by an impressed line; anterior angles produced, but not as strongly as in male, subacute; sides gently arcuate to posterior quarter and diagonal to base, basal angle broadly arcuate, basal margin straight, lateral and basal margins strongly punctate and feebly reflexed; disc finely, but not closely, punctured.

Scutellum as in the male, but less punctate, medially impunctate. Elytra reddish-brown, excepting the suture, lateral margins and scutellum which are darker; basad narrower and rugulose, humeri rectangular, rounded, parallel for three-fourths of their length, attenuate in posterior fourth and rounded apically; irregularly punctato-striate; striae deep and strongly delimiting (overemphasized in the illustration) three broad elytral intervals, which attain the lateral declivity, destitute of marked punctuation in basal half; strial punctures (four rows) fairly large, oblong, circular on lateral margins; punctuation of posterior third more closer, confused.

Legs as in the male, but proportionally more robust; anterior tibiae broader, five-dentate externally, and tibial spines stronger.

Underside dark chocolate-brown, excepting the mandibles and mentum which are black, subopaque. Mentum transverse, slightly hollowed medially, transversely rugose. Prosternal process plain

and obtuse behind. Ventral segments not so closely punctured as in the male, fifth segment non-setose. On the whole, the ventral pubescence described for the male is nonexistent in the opposite sex, at most being indicated by inconspicuous minute setosity on posterior margins of the femora.

Measurements (in millimeters):

	Length ♂	Width ♀
Head	3.8 x 7.5	3.2 x 6.1
Mandibles	4.5	2.2
Prothorax	5.2 x 8.9	5.0 x 8.2
Elytra	14.5 x 9.3	13.5 x 8.2

Holotype: 1 ♂, ARISAN, FORMOSA, VI, 2, 1932, J. L. Gressitt, collector, in the collection of the California Academy of Sciences (ex coll. J. Linsley Gressitt). *Allotype:* 1 ♀, Baibara, Formosa, VII, 14, 1937, B. Benesh collection, Accession No. 4593 (ex coll. Y. Miwa).

The male approximates in habitus *D. vicinus* Saund., from which it is readily distinguished by the less exserted mandibles and shining dorsum (*vicinus* opaque throughout). The female with its broad head (nearly as wide as the prothorax) and elongate body, somewhat resembles, on a larger scale, our scaritid groundbeetle, *Scarites subterraneus;* it was received from Dr. Yushiro Miwa of Taihoku, Formosa, May 5, 1939, with the annotation "unknown Dorcid ♀."

Dorcus clypeatus Benesh, new species

Figure 5, ♂

Black, depressed. Head, mandibles and pronotum finely granulate, of satiny aspect; elytra roughly sculptured, shining; evidently a relative of *Dorcus glabripennis* Westwood.

Male. Head transverse, twice as broad as long, anterior nearly straight, antero-lateral angles obtuse and slightly emarginate, canthus parallel, circumscribing the eye in anterior half; postocular section slightly produced and gently arcuate to base; disk sloping towards the front. Clypeus, from which the specific name is derived, remarkable in its peculiar form and variation, differs in the typical male from the two smaller paratype males; it is broad, concavely excised, and has a lateral digitiform process; subclypeus broader than the clypeus, acutely angulate on sides and discernible, when viewed from top, as a small lateral projection; in the two paratype males it is simply broad and truncate, without the excision and subclypeal process. Mandibles symmetrical, acute, cylindrical in cross-section, near the upper center with a strong, dorsally flattened and slightly backwards directed obtuse tooth. Antennae with clava and funicle slightly shorter than the

scape, clava rufous, pubescent; funicle and scape glabrous, black, nitid.

Prothorax broader than long, sinuate in front, anterior angles produced and subacute. Sides in anterior third with a feeble emargination, uniformly arcuate to a pronounced acumination at median third; posterior third diagonal to basal angles, the latter broadly arcuate. Base apparently straight. Lateral margins narrow and explanate, slightly reflexed and delineated by an impressed line, remotely punctured in anterior angles and along the lateral margins.

Scutellum heart-shaped, broader than long, transversely elevated across the middle, front and rear declivous, cribripunctate. Elytra ogival in the typical male (parallel in the two smaller males), broadest in anterior third, humeri produced and mucronate; sides gently convergent from near the middle to posterior third, thence regularly rounded to apex; irregularly punctatostriate from ante-humeral area to scutellar margin, forming uneven intervals between the four recognizable striae, these interstices slightly convex and with scattered punctures; sides more rugulose than in adjacent areas and with two or three rows of punctures.

Legs fairly short and stout; anterior tibiae strongly furcate and externally four to six dentate; intermediate and posterior tibiae armed in apical third with a single spine; tarsi slender, shorter than the tibiae, ventrally setose.

Beneath finely punctured and more shining. Mentum transverse, narrowing towards the front, flattened, with basal transverse depression, anterior angles broadly arcuate, base straight; sculptured throughout with horseshoe-shaped confluent impressions. Maxillary palpi piceous, shining. Prosternal process broadened posteriorly and terminating in a round node, with an elongate impression between coxal cavities; a lateral lamina present on each side at base.

Female: Agrees in habitus with the female of preceding species, but with the following distinct characters: head more rugose; mandibles shorter and broader at base; eyes round and parallel (not slanting as in *gracilicornis*); lateral margins of prothorax less arcuate; elytra more coarsely sculptured, with striation more pronounced; ventral punctuation coarser and more remote. Prosternal process as in the male, but simple, without depression; concolorous throughout (*gracilicornis* bicolored).

Measurements (in millimeters):

	Length ♂	Width ♀
Head	4.9 x 9.9	3.1 x 6.0
Mandibles	6.0	1.9
Prothorax	6.5 x 11.4	5.4 x 8.0
Elytra	14.3 x 11.5	13.7 x 8.5

Holotype: 1♂, SAKAHEN, FORMOSA, VII, 15, 1934, J. L. Gressitt, collector, in the collection of the California Academy of Sciences (ex coll. J. L. Gressitt). *Allotype:* 1♀, Taiheizan, Formosa, VII, 6, 1934, J. L. Gressitt, collector, in the collection of the California Academy of Sciences (ex coll. J. L. Gressitt). *Paratypes:* 2♂♂, Hassonzan, Formosa, VII, 25, 1934, J. L. Gressitt, collector, in the collection of the writer and that of the California Academy of Sciences.

The three males are apparently of minor development, indicated by the feeble lateral emargination of the pronotum, and irregular striation of elytra in the typical male. The smaller paratype males display simple pronotum, without emargination or excision, and the elytra are more regularly striate, approaching that of the female. It can be safely assumed that in examples of maximum development, when discovered, the pronotum will have the characteristic S-like excision and smoother elytra of its gigantic congeners, as is evident in *Dorcus antaeus, grandis, hopei* and *parryi*. Both females here described are remarkable for their extremely pedunculate body, a character that is more pronounced than in any other species of Lucanidae known to the writer.

DORCUS NITIDUS Kirsch

Mittheilungen Mus. Dresden, 2:138, 1877.

Two males and five females of this interesting species have been collected by J. L. Gressitt in Formosa: 1♂, Hori, VI, 21, 1932; 1♂, Mizuho, VI, 21, 1932; 2♀♀, Hori, June 1932, April 1935; 1♀, Bukai, VI, 16, 1934; 2♀♀, Bukai, May 1935.

This is a new addition to the lucanid fauna of Formosa, hitherto known from the Papuan Region; it is a well marked species, in which the antennae are distinguished by double setae at the apex of the anterior margin of each of the last four segments of the funicle.

Genus PROSOPOCOILUS Hope

The dish-faced stagbeetles.

Catalogue of the Lucanoid Coleoptera, p. 30, 1845.
(=*Cladognathus* Burmeister, Handbuch der Entomologie, 5:364, 1847).

PROSOPOCOILUS PICEIPENNIS (Westw.)

Cladognathus piceipennis Westw., Trans. Ent. Soc., London (2) 3:202, pl. X, fig. 6, ♂, 1855.

Hemisodorcus picipennis Van Roon, Cat. Coleop., Pars 8, Lucanidae, p. 32, 1910.

Three females taken by Gressitt on Hainan Island: 2♀♀, Dwa Bai, VII, 25, 1935; 1♀, Liamui, VIII, 3, 1935.

This record extends the known range of *piceipennis* from the Asiatic mainland to an insular stepping-stone; it will probably be found to occur on Formosa also. Westwood originally placed the male with some doubt as a variety of *P. gracilis* (Saund.), from which species it differs in having broader mandibles, that are armed at base with an inwardly directed tooth. The female of *piceipennis* is obovate, on the average much larger than *gracilis*, has the dorsum rugulose and has a much broader canthus, which is rectangular opposite the eyes.

Genus AEGUS MacLeay

Horae Entomologicae, 1:112, 1819.

Aegus horridus Benesh, new species

Figures 1, 1a, ♂.

Dark chocolate-brown, opaque, with the exception of the head which is black.

Male. Head transverse, nearly three times as broad as long, anterior margin nearly straight, antero-lateral angles obtuse, sides diagonally divergent from the anterior angles to a point opposite the eyes; cheeks parallel; basal angles obtuse, converging to basal margin; margins of anterior half of head beset with golden setae. Clypeus broad, semicircularly excised, setose on top and front. Disk nearly flat, declivous to front, with a transverse-frontal ridge, produced in center, on line with the anterior edge of the eyes. Eyes small, facetted, golden-orange. Mandibles porrect, furcate at apex, strongly keeled above for three-fourths their length; distantly punctured above and beneath; beset with sparse, coarse, stubby setae; apical fourth and keel nude; inner margin with an obtuse basal tooth, thence indentate to apical fourth; apex somewhat palmate, with a large inwardly directed tooth and a broad bicuspid. Canthus and cheek nearly united, with a minute hiatus opposite the base of eyes, fully encompassing the eyes. An-

tennae slender; scape nearly as long as the funicle and clava combined, black basally, geniculation blood-red, slightly bent. Funicle as long as the clava, first funicular segment pyriform, cherry-red, nitid; the rest of funicular segments black, opaque, setose on anterior and posterior margin, and two rows of setae above and below. Clava three-segmented, rufous, pubescent, beset with golden setae.

Prothorax twice as broad as long; anterior margin sinuate, anterior angles subacute. Sides diverging to apical third, thence parallel to about basal third, basal third to base excised; basal angles broadly arcuate, basal margin undulate. Disk with a feeble median canaliculation, paralleled on each side by a frontal circular and basal reniform depressions; disk sloping laterad; remotely punctured by large shallow punctures, margins impunctate and setose.

Scutellum ogival, broader than long, squamose. Elytra convex, dark chocolate-brown, glabrous, impunctate; parallel, posteriorly regularly rounded, apex setose.

Legs slender, setose throughout, excepting the tops of femora. Anterior tibiae furcate, the furcation bent downwardly, outer margin feebly and distantly six-dentate. Intermediate and posterior tibiae with a median, hardly discernible spinule. Tarsi shorter than the tibiae, setose.

Beneath opaque throughout, excepting the mandibles which are shining. Mentum broad, narrowing to front, anterior angles rounded, anterior margin broadly concave and setose. Genae and gula remotely punctate, squamose. Prosternal process shallowly canaliculate, terminating in a round node. Ventral abdominal segments emarginate, the margins somewhat elevated; terminal segment strongly setose.

Female. Unknown.

Measurements (in millimeters):

	Length	Width
Head	2.8	8.1
Mandibles: right	5.4	
left	5.6	
Prothorax	4.2	8.2
Elytra	10.7	8.2

Holotype: 1 ♂ NUEVA VIZCAYA, LUZON, PHILIPPINE ISLANDS, in the B. Benesh Collection, North Chicago, Illinois, accession No. 5240.

Apparently allied to *Gnaphaloryx perforatus* Rits.[1] from which it differs in mandibular armature, vestiture and size.

[1]Assigned to *Aegus* by Arrow, Trans. Royal Ent. Soc., London, 83:118, 1935; whether it really is an *Aegus* is a moot question.

(To be continued in next issue.)

THE MEETING POINT OF AMBRYSUS AND PELOCORIS IN NEVADA

(Hemiptera: Naucoridae)

BY IRA LA RIVERS
University of Nevada, Reno

Until the recent discovery of a new species of *Pelocoris* in Nevada, it was customary to think of that genus as confined to the United States east of the Rocky Mountains, while *Ambrysus* was the western representative of the family, neither overlapping the other in range. With the description of *Pelocoris shoshone* La Rivers (1949) from Ash Springs, Pahranagat Valley, the range of the genus was extended over 800 airline miles westward, the new species representing an apparently isolated population completely surrounded by Ambrysi. The type locality was not thoroughly collected at the time, and no other naucorids were taken.

During a recent winter fish-collecting trip into southern Nevada, the general area was re-visited and more painstakingly searched for additional naucorid material, with rewarding results. The itinerary was from south-to-north, and the type locality of *P. shoshone* was one of the last places to be examined. Collecting northwesterly from Las Vegas, naucorids were first taken at a remarkably endemic area known as Warm Springs, the source of the Muddy or Moapa River, in Clark County just south of the Lincoln County line. Lying in the old course of Pleistocene White River, Warm Springs exhibits many remnant populations in both its vertebrate and invertebrate faunas. I was initially attracted to its possibilities by the fact that Hubbs and Miller had recently described a new genus of cyprinid fish from there (*Moapa coriacea*, 1948), specimens of which I wanted for our museum. During preliminary collecting at Warm Springs, the first naucorid taken was somewhat startling, being a new limnocorine, a subfamily of Naucoridae hitherto unknown in the United States. In one of the swift, warm outlet streams (pH 7.3, temperature 89°F) of the main source pool, an occasional *Ambrysus mormon* Montandon 1909 was intermixed with the limnocorine population in the ratio of approximately 1::20.

Nearby, on a low rise, a small marsh gave rise to water which spilled down the 15-foot slope at the east end of the marsh and

then meandered some 30 yards eastward through short grass to the main stream. At its origin, the marsh water was 83°F; at its terminus, 75°F. This brief system was found to contain all three genera of Naucoridae; in its lower reaches, the limnocorine was present, giving way to increasing numbers of *Ambrysus mormon*, which latter was the only species present in the swiftest portion of the stream where it descended the slope. Above these points, in the marsh waters, *Pelocoris shoshone* was the sole naucorid, occurring typically in the quiet waters under overhanging turf banks. Previously, *P. shoshone* had been known only from the type locality, some 55 airline miles northward.

Subsequent intensive collecting failed to alter the picture. It thus seems that the above-mentioned naucorids are rather markedly restricted to certain specific habitats, although a full-season's sampling may alter this picture. Conversely, an associated *Stenelmis* was found abundantly represented in all these habitats, indicating much less specificity.

The next productive collecting spot northward was Ash Springs, also on the remnant course of White River, where *P. shoshone* was the commonest naucorid, and, in point of fact, the commonest hemipteran—as at Warm Springs, it was confined to quiet waters, preferring vegetation or the overhanging turf banks, and so was found chiefly near the vicinity of the source springs of the long, winding, Ash Springs channel; many of the springs were in the nature of motionless seeps with several feet of mud bottom. However, collecting at the point where two outlet creeks carried water from the quiet channel, showed *A. mormon* to be dominant; in only one instance, under a bank at the immediate outlet, were *Ambrysus* and *Pelocoris* taken together in one sweep of the seine.

Ambrysus mormon is already well-known as the most widely distributed member of its genus in the United States; it and *P. shoshone* are fully winged, and the latter may be expected to occur more widely than its present known range indicates. The limnocorine, however, is incapable of flight, and very probably is restricted to the thermal waters of the Warm Springs area, and there solely to swift streams with suitable gravel bottoms.

Literature Cited

Hubbs, Carl L. and R. R. Miller. 1948. Two new relict genera of cyprinid fishes from Nevada. Occas. Papers Mus. Zool. Univ. Mich. No. 507:1-30.

La Rivers, Ira. 1949 (1948). A new species of Pelocoris from Nevada, with notes on the genus in the United States (Hemiptera: Naucoridae). Ann. Ent. Soc. Amer. 41(3):371-376.

LIFE HISTORY NOTES ON *INCITA AURANTIACA* HY. EDW.

(Lepidoptera: Phalaenidae)

BY WILLIAM H. EVANS

Sun Valley, California

In the Gavilan Hills of Riverside County, California, on April 19, 1948, I observed several females of this species laying eggs between the hair entangled terminal bracts of young plants of *Gilia virgata* var. *dasyantha* (Brand.). Each moth required from 8 to 16 seconds to force its ovipositor through the dense wooly hairs and attach an egg near the base of a bract.

In the breeding cage, the eggs hatched on May 8 and 9; and the tiny larvae entered the *Gilia* buds. During the early instars the larvae remained hidden inside the buds and fed on the partially developed floral parts; during the last three instars they rested on the stems and ate blossoms and wooly hairs of the food plant. Leaves and stems were never eaten. In their last instar, I substituted flowers of *Gilia densifolia* Benth., which they readily accepted. Larvae enter the soil to pupate. A brief description of the mature larva follows:

Length 20 mm. Ground color greenish-white. A prominent mid-dorsal brown stripe extends from the second segment to the anal extremity. The following brown markings extend the entire length of the body; a subdorsal stripe which is rather indistinct on all but the first four segments; an irregular dorso-lateral stripe consisting of two fine, confluent lines; a rather dim lateral stripe; and a distinct supropodal stripe. There are a few brown markings on the prolegs. In the dorso-lateral area of each segment from 3 to 10 inclusive, there is a conspicuous rounded black spot a little forward of the center of the segment. The black spots on opposite sides of each of these segments are connected by a transparent orange bar which extends across the dorsal area. One larva lacked black spots on the third segment.

A NEW GENUS AND SPECIES OF APHIDIDAE ON ALOE

(Homoptera)

BY E. O. ESSIG

University of California, Berkeley

A curious aphid which was collected on *Aloe aristata* in a nursery at Glendale, California by members of the Los Angeles County Agricultural Commissioner's Office, Los Angeles, California, was sent to the writer for identification. The specimens could not be determined either to genus or species and a thorough check of literature failed to show that such a species had ever been previously described or named. As this aphid attacks ornamental plants of economic importance it seems advisable to describe and name it so that it may be properly referred to and recorded.

Aloephagus Essig, new genus

Apterous form. Body regulary oval, beset with relatively few short stiff hairs or spines and with irregular and circular groups of glands somewhat similar to those in *Eriosoma;* small rounded tubercles—1 pair on the prothorax and 6 pairs on the abdomen. Eyes small, 3-faceted. Antennae 5-segmented. Rostrum long and slender. Legs short. Cauda triangular.

Type species: *Aloephagus myersi* Essig.

Aloephagus myersi Essig, new species

Apterous viviparous parthenogenetic female (fig. 1). General characteristics as indicated above for the genus *Aloephagus.* Body dull-green or pruinose with dusky markings as illustrated; sparsely covered with short spines arranged in transverse rows on the abdominal segments; with groups of glandular areas; rounded lateral tubercles on the prothorax, and six obvious addominal segments. Antennae 5-segmented, and with few hairs nearly as long as the width of the segments; III only slightly longer than V and with the unguis nearly twice as long as the base. Eyes small and 3-faceted; rostrum long, extending nearly to the tip of the abdomen, slender with apical segments somewhat swollen with few short hairs. Cauda nearly the form of an isosceles triangle with many short, stout curving hairs.

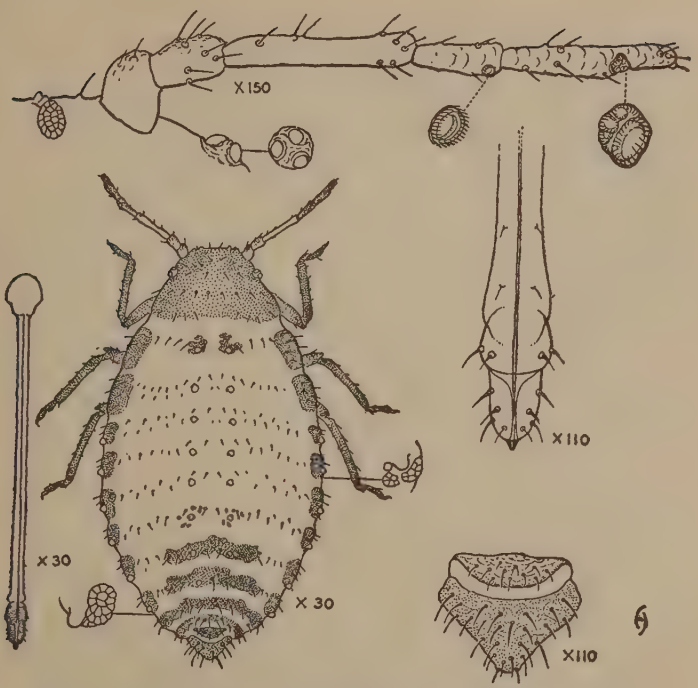

Fig. 1. *Aloephagus myersi* Essig, n. sp. Apterous form and important characters including portion of front of head showing wax glands, antenna, faceted eye (side and front), and rostrum. (Drawing by Frieda Abernathy).

Host plants and distribution in California. Holotype: WEST LOS ANGELES, October 28, 1939, on *Aloe* sp., nursery, F. R. Platt, collector (first report). On *Haworthia rugosa* in quarantine from South Africa, at Inglewood, December 4, 1940, 2 specimens; F. R. Platt, collector. On *Haworthia* sp., Santa Monica, April 25, 1944, 1 specimen; J. Caldwell, collector. On *Haworthia* sp., nursery, Glendale, April 7, 1947, 4 immature specimens; M. Wagner, collector. On *Aloe aristata,* nursery, Glendale, October 3, 1947, 24 specimens; L. E. Myers, collector. These specimens were fresh and covered with white pruinose wax. On *Aloe variegata,* Inglewood, November 12, 1948, 3 specimens; A. D. Phelps, col-

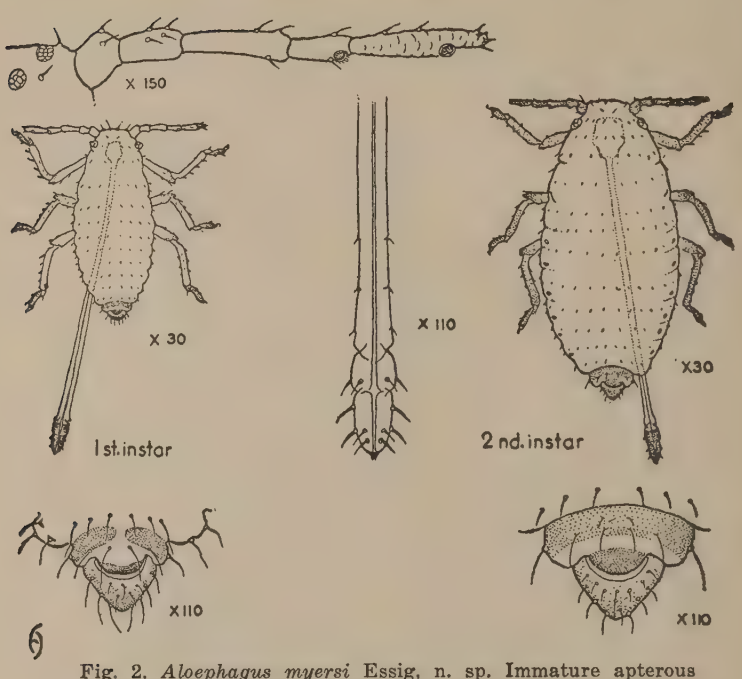

Fig. 2. *Aloephagus myersi* Essig, n. sp. Immature apterous forms. The extremely long rostrum grows but little after birth. (Drawing by Frieda Abernathy).

lector. On *Aloe variegata* (?), Inglewood, September 24, 1948, 6 specimens; A. D. Phelps, collector. On *Aloe* sp. Glendale, October 14, 1948, 3 specimens; W. D. Dyer, collector. An additional collection, July 19, 1949, on *Aloe africana*, Glendale, W. D. Dyer, numbering about 150 specimens on 13 slides received from L. E. Myers.

The entire collection numbering some 193 specimens, mounted mostly in diaphane on 32 slides is distributed as follows: type and 26 slides of paratypes, in author's collection; additional paratypes: 2 slides to State Department of Agriculture, Sacramento; 1 slide to the California Academy of Sciences, San Francisco; 1 slide to the office of Los Angeles County Agricultural Commissioner, Los Angeles; 1 slide to the U. S. National Museum, Washington, D. C.; 1 slide to the British Museum of Natural History, London, England.

NOTES ON CANTHARIS III

(Coleoptera: Cantharidae)

BY DOROTHY MC KEY-FENDER[1]

McMinnville, Oregon

Some years ago when the author and her husband first became interested in Coleoptera, the late Ralph Hopping suggested the Cantharidae as a group in need of revisional work. Beginning on the genus *Cantharis*, the author assembled as much material as possible (both Nearctic and Palearctic) and, in the hope that a fresh approach might be of value, genitalic dissections of all males were made and the species grouped solely on that basis. The North American species fell into seven distinct groups, a grouping that was later supported by other equally important characteristics. The Palearctic material at hand seems to fit well into the author's concept of the subdivisions of the genus but the limited material available necessitates postponement of a study of other than the Nearctic material. The key to the groups herein presented applies to Nearctic material.

The complex generic and subgeneric interrelationships of the Cantharini as a whole offer a fascinating field for study but can only be effectively worked out from the world standpoint.

Some of the subdivisions of the genus *Cantharis* as here constituted must more properly be considered distinct genera. This is true of Divisions I and II of Green (1941), while the author considers the groups under Division II at least of subgeneric rank. In this paper the author presents a discussion of the groups into which the North American *Cantharis* fall, with descriptions of new material in some of the groups. The work is frankly preliminary, but it was felt that further descriptions of new species without correlating them with the rest of the genus were inadvisable.

The author's appreciation is due W. J. Chamberlain for his help in outlining these studies in their early stages; C. A. Frost and P. J. Darlington for their examination of type material; J. W.

[1]Because of the difficulties which arise from two persons of the same name describing material in the same group, it has been considered advisable that the author use the hyphenated name-form McKey-Fender, thus avoiding confusion with the work of her husband, K. M. Fender. The two species of *Cantharis* previously described by the author should preferably be cited *C. dentata* McKey-Fender and *C. bilobata* McKey-Fender.

Green for the loan of his entire Division II collection and for his friendly exchange of ideas; and the author's husband, K. M. Fender—a good listener. The cooperation of many individuals and institutions in making material available for this study is deeply appreciated and to E. S. Ross and Hugh B. Leech in particular the author's thanks are due.

KEY TO THE GROUPS OF NORTH AMERICAN CANTHARIS (*s. lat.*)

1. Third tarsal segment simple, insertion of fourth segment apical, last visible sternite of female unmodified.....*Division* I
– Third tarsal segment emarginate, insertion of fourth segment ante-apical, last visible sternite of female (where known) modified .....*Division* II 2
2. Mandibles toothed, anterior claw of all tarsi bluntly toothed or thickened at base, cleft at tip, the two apical parts similar (Fig. 16)*.....Subgenus *Cyrtomoptera*
– Mandibles simple, claws not as above 3
3. Elytral pubescence duplex, short appressed and longer scattered erect hairs; only anterior claw of male protarsi thickened at base, cleft at tip, the two apical parts dissimilar, all claws of female simple (Fig. 15) .....subgenus *Cultellunguis*
– Elytral pubescence simple (except some *Cantharis, s. str.*), claws not as above 4
4. Some claws cleft or toothed 5
– All claws simple 7
5. All claws cleft (Fig. 17) .....*Carolina* Group
– Some claws toothed 6
6. Anterior claws of all feet invariably acutely toothed (Fig. 18) .....Subgenus *Ancistronycha* (part)
– Anterior claws of at least some feet bluntly toothed or lamellate (all males and some females, Figs. 19 and 20).....*Cantharis s. str.*
7. Slender species, thorax appreciably narrower than elytra, tarsi slender (applies to males, females of our species unknown).....*Absidia*
– Robust species, thorax broad, tarsi broad, lobed (applies to females, see couplet 6) .....*Cantharis* (*s. str.*)

DIVISION I

Rhagonycha Esch. 1830 (part)

Green's (1941) excellent treatment of this group of *Cantharis* is the only systematic work on the genus since Leconte's 1881 synopsis. It covers some forty species, all small and distributed throughout the United States and Canada excepting for the West

*Illustrations to appear in next issue.

Coast states, and which form a closely-knit group, presumably of generic status. It includes the North American species usually placed in *Rhagonycha* except *C. carolina* Fab. and *C. bilobata* McKey-Fender, which are in a distinct group, and those placed in *Ancistronycha* in the Leng "Catalogue of Coleoptera" except *C. loweri* Pic (*decipiens* Horn), a *Cantharis* (*s. str.*), and *C. dentiger* Lec. and *C. neglecta* Fall which with *C. bilineata* Say probably are truly *Ancistronycha*. Though the generic or subgeneric name which should finally apply to Division I remains in doubt, the old name *Rhagonycha* applies to many, possibly most, of the species and is herein retained. Aside from the key characters, the group may be characterized by the male genitalia which have the dorsal plate a simple or emarginate lobe, the median processes (median "hooks" of Division II) rudimentary, represented only by chitinized patches on the median lobe, and the internal sac with setiferous patches.

Division II

The species of Division II average much larger than those of Division I. The internal sac of the male genitalia lacks the definite patches of bristles of that of Division I, but the median lobe has well developed hooks. The apex of the last visible sternite of the female (eighth abdominal) in this group is variously modified. While the shape of this modification offers good specific distinctions, the distortion of dried specimens prevents its taxonomic use except by special methods of study and is therefore not emphasized. The presence of such modifications in *Absidia* has not been demonstrated, since the females of our species are unknown, nor has the author seen females of European *Absidia*. Although the author has made use of specimens relaxed and cleared with weak KOH and observed in glycerine in the preparation of these studies, emphasis is placed on characters apparent by conventional methods of study. The genitalic drawings depict only the terminal parts of the genital armature (dorsal view), these being sufficiently diagnostic. Distribution data are based on material seen by the author.

Subgenus Ancistronycha Mark. 1851 (*part.*)

Cantharis bilineata Say, 1823, *C. dentiger* Lec., 1851 and *C. neglecta* Fall, 1919, constitute the North American representatives of this sub-genus. Their close relationship is clearly shown by the male genitalia as well as the form of the ungual tooth

(Fig. 18). *Dentiger* and *neglecta* are kindred species, their specific resemblances being emphasized by a hind-wing venation common to both and unique in the *Cantharis* known to the author, while *bilineata*, in wing venation and in the simple posterior claw of each pair tends toward *Cantharis* (*s. str.*), a relationship indicated by several European forms as well. Two apparently new species in this group are in the author's collection but are represented only by females and therefore will not be described at this time. The male genital armature of these species has the dorsal plate very much shorter than the ventral lobes and truncate, the ventral lobes very strong and hooked, the tips bi-dentate, the median "hooks" dorso-ventrally flattened, short and triangular. A key to the species follows:

1. Only anterior claw of each pair toothed, pronotal maculation normally bilineate (Eastern U. S. south to Georgia, west to Oklahoma and Minnesota) ..... *bilineata*
– All claws toothed, pronotal maculation confluent medially 2

2. Pronotum smooth, shining, sub-quadrate (Eastern U. S. south to New Jersey, west to Oklahoma and Minnesota) ..... *neglecta*
– Pronotum densely punctate, rough, transverse (Northeastern U. S. west to Ohio. The Leng catalogue also lists Indiana and Texas) ..... *dentiger*

Carolina Group

Two closely related and very similar species fall in this group. They are *C. carolina* Fab. 1801 with its pale color-phase *C. jactata* Say 1825 and *C. bilobata* McKey-Fender 1941, also occasionally pale. The remarkably great development of the basal plate of the male genital armature of these species is found in no other North American group of *Cantharis*. It is very unlikely the name *Rhagonycha* should apply to these two species, but description of the group as new is postponed pending further study. No palearctic species yet examined by the author belongs with these species. The species may be separated as follows:

1. Pronotal maculation interrupted laterally, tips of ungual divisions divaricate, eyes large, pronotal margins broadly reflexed, disc comparatively flat, ventral lobes of tegmen bilobed apically (boot-shaped) . . . (Quebec south to North Carolina, west to New Mexico? or Oklahoma and northern Minnesota) ..... *bilobata*

2. Pronotal maculation normally with unbroken edges, tips of ungual divisions approximate, eyes small, pronotal margins

narrowly reflexed, disc moderately to strongly convex, ventral lobes of tegmen simple apically (Maine to Key West, west to Oklahoma and Minnesota) ..... *carolina*

Subgenus Cyrtomoptera Mots. 1859

Cyrtomoptera Motschulsky, 1859, Coleopteres Nouv. de la Californie, Bull. Moscou, 32: 401.
(*Cyrtomatoptera* Mots.); loc. cit. p. 399.

In the above paper Motschulsky applied the name *Cyrtomoptila*, both in the key (p. 398) and the text (p. 401) only to the European *Cantharis lateralis* L. In the key, *Cyrtomoptila* is distinguished from *Cyrtomatoptera* in having the claws simple apically (i.e., "non fendus a leurs extremites"). In the text (p. 401) *Cyrtomoptera* (note spelling) is stated to be a new genus, the species *Cyrtomoptera latiuscula* Mots. being described and *Cantharis binotata* Mannh. and *Telephorus divisus* Lec. being designated congeners, while the American species, i.e., *Cyrtomoptera*, are again noted to differ from the European genus *Cyrtomoptila* in having the inner claw cleft apically (*C. lateralis*). In view of these facts it seems unlikely that *Cyrtomoptila* should take precedence over *Cyrtomoptera* in spite of its anterior position in the publication. As *Cyrtomoptera* is the spelling which accompanies the "definition" of the genus, it should be preferred over *Cyrtomatoptera*, which is used only once in the key.

C. latiuscula Mots. has been made a synonym of *Cantharis divisa* Lec., which thus becomes the type of the genus. *C. binotata* Mann. (ex err. *notata* Mann. 1843) has been renamed *C. americana Pic*, 1906, and is the type of the subgenus *Cultellunguis* (v. sub.). Thus of the older species *C. divisa* alone remains and this species together with *C. dentata* McKey-Fender, 1944, constitute the subgenus *Cyrtomoptera*.

In addition to Motschulsky's characterization of this subgenus, which emphasizes the form of the claws and the tuberculate sculpture of the elytra, attention must be called to the dentate mandibles, a condition unique in the imagoes of North American *Cantharis*. The male genital armature is characterized by the simple dorsal plate with undeveloped lateral sinuations, the ventral lobes expanded at least basally. The species may be separated as follows:

1. Pronotum normally maculate, last ventral of female with a rufous apical spot, not thickened laterally, dorsal plate of male

armature simple apically, 5.5 to 10 mm., averaging 8 mm. (Low to moderate elevations along coast, San Diego, Calif., north to Vancouver Is. and southwestern mainland of British Columbia, and including the Sacramento, Calif., Willamette, Ore., and Yakima, Wash., valleys.) ..... *divisa*

2. Pronotum immaculate, last ventral of female rufous apically and medially, thickened laterally, dorsal plate of male armature emarginate apically, 6 to 10 mm., averaging 9 mm. (Higher elevations in the Sierra Nevada, and Mt. Hamilton, Santa Clara Co., California.) ..... *dentata*

Cultellunguis McKey-Fender, new subgenus

Male: Size moderate (6.5 to 9 mm.), slender with relatively long legs and antennae. Head shining, finely punctate, pubescence fine, appressed. Antennae filiform, slender, second segment one-half to two-thirds length of third. Clypeus comparatively short, terminal segment of maxillary palpi elongate, trapezoidal, outer limb much longer than the inner, distal side gently arcuate, apex subacute (Fig. 14). Pronotum subquadrate or slightly elongate, never transverse in the known species, narrower than elytra, shining, virtually impunctate, pubescence fine and sparse. Elytra rugose, tuberculate, sculpture arranged in faint longitudinal lines the prominence of which varies in the species, relatively slender, edges a little thickened. Elytral pubescence duplex, consisting of a relatively dense layer of soft appressed hairs and a layer of longer scattered stiffer hairs. Tarsi lobed, apex of third segment emarginate, insertion of fourth segment ante-apical. Anterior claw of pro-tarsi thickened at base forming an inconspicuous tooth, cleft at tip, the outer cleft portion flattened like a knife blade,—i.e., cultellate (Fig. 15), all others simple. First pro-tarsal segment a good deal longer than those following and broad to very broad, the proportions varying specifically. Tarsi otherwise rather slender.

Genital armature consisting of the well-chitinized, lobed tegmen and tubular median lobe bearing the paired, strongly chitinized median hooks and terminating in the membranous internal sac, which is armed apically with a long flagellum composed of a bundle of long slender bristles. (This structure has been detected in the majority of the species, scarcity of material preventing the necessary preparations in the others.) The terminal portion of the dorsal tegminal plate is bifurcate medially, sinuate laterally; the ventral lobes are much flattened and folded; the basal portions moderately chitinized, a pair of curved plates investing only the proximo-lateral portions of the tegmen, leaving the terminal parts well exposed. The form of the lobes offers reliable specific distinctions.

Female: Differs in having the eyes relatively smaller, antennae shorter, form a little stouter, the first protarsal segment not broader than the others, claws all simple.

Type species: *Cantharis americana* Pic, 1906 (*C. notata* Mann.)

The knife-like shape of the outer cleft portion of the anterior protarsal claws of the male is very characteristic and it is from this feature that the subgenus takes its name. The shape of the tip of this portion and its comparative length varies specifically. The shape of the last segment of the maxillary palpi is also quite distinctive (Fig. 14). *Cyrtomoptera* alone approaches it in form, while species of the other groups have the two limbs more nearly equal (Fig. 13) except a few *Cantharis* s. str. which are intermediate (*consors, rotundicollis, curtisii*) and subgenus *Absidia* in which the inner angle is obscured (Fig. 12).

Cultellunguis includes a well marked group of species which are concentrated in Southern California, one species having been taken in Baja California, Mexico (Ensenada and Catavina), and only one extending north of San Francisco along the coast through Oregon and into Washington. Previously described species include: *americana* Pic, 1906 (*notata* Mann, 1843), *americana larvalis* Lec. 1860, *lauta* Lec., 1851, *ochropa* Lec., 1881, *ingenua* Lec., 1881, and *perpallens* Fall, 1936. In addition *hatchi, macnabiana, mackenziei, americana montereyensis, perpallens sanctaeclarae* and *ingenua knulli* are herein described. A key to the species follows:

1. Legs pale or bicolored 2
– Legs black 10
2. Elytra dark 3
– Elytra pale 8
3. Head entirely black behind eyes 4
– Head entirely pale or with a black occipital spot or spots of variable size 5
4. Clypeus scarcely emarginate apically, sides arcuate, apex of abdomen pale, last ventral of male deeply, broadly emarginate, the sides produced and flattened ..... *ochropa*
– Clypeus strongly emarginate apically, sides oblique, usually piceous beneath (sides and apex of abdomen rarely narrowly pale), last ventral of male simple ..... *macnabiana*
5. Anterior angles of pronotum distinct 6
– Anterior angles of pronotum not evident, evenly rounded into the deeply convex anterior margin .... *perpallens sanctaeclarae*
6. Legs unicolorous ..... *americana americana*
– Knees black 7
7. Prothorax yellow, form slender, male metacoxae with a conical projection ..... *hatchi*

– Prothorax maculate, form robust, male metacoxae simple ..... *americana montereyensis* (part)

8. Anterior angles of pronotum indistinct, evenly rounded into the deeply convex anterior margin, coloration entirely pale, form slender ..... *perpallens perpallens*
– Anterior angles of pronotum distinct, elytra pale with narrow dusky border, pronotal and occipital maculations present, form robust 9

9. Legs entirely pale ..... *americana larvalis*
– Knees black ..... *americana montereyensis* (part)

10. Long hairs of elytra fulvous or golden, last ventral of male broadly, very deeply emarginate, the sides of the emargination prolonged and flattened ..... *mackenziei*
— Long hairs of elytra black, last ventral of male broadly shallowly emarginate, sides not modified 11

11. Form robust, first male protarsal segment broadly expanded, tegminal lobes broad ..... *ingenua ingenua*
— Form slight, first male protarsal segment not broadly expanded, tegminal lobes not notably expanded ..... *ingenua knulli*

Unknown to the author: *C. lauta* Lec. 1851. It would run to couplet four in the key.

Cantharis (Cultellunguis) americana Pic[2]

Cantharis notata Mannerheim, 1843, Beitr. Käferf. der Aleutischen Ins. etc., Bull. Moscou, 16: 246.

Cantharis binotata Motschulsky (nec Mannh.; ex err.) 1859, Bull. Moscou, 32: 401.

Cantharis peregrina Boheman, 1858-1859, Kongliga Svenska Fregatten Eugenies Resa, etc., Coleoptera, Stockholm, p. 80.

Cantharis americana Pic, 1906, L'Echange, 22: 81.

Elytra piceous, head flavo-testaceous with black maculation behind eyes varying from a pair of spots postero-medially from antennae, to a black area occupying much of the head behind eyes; antennae flavo-testaceous, apical fourth often infuscate; pronotum flavous to testaceous, paired or coalesced black or brown maculation on the anterior half of disc; scutellum, legs and sides and apex of abdominal segments testaceous, sternum piceous; form moderately robust.

Male: Width at base of elytra 1.75 mm., length 8 mm., antennae 6 mm. Clypeus short, emarginate, margin arcuate on either side of center. Antennae not quite reaching two-thirds of body length; eyes small. Pronotum subquadrate, anterior angles prominent, anterior margin moderately convex from the anterior angles; sides sinuate, constricted immediately behind anterior angles and again less strongly immediately before the posterior angles; posterior angles very distinct, a right angle or very slightly greater, posterior margin moderately convex from a little within the posterior angles, not or very slightly sinuate at middle; pronotal edges re-

[2]The name *notata* is preoccupied by *C. notata* Waltl., 1838, a synonym of *C.* (*Metacantharis*) *discoidea* Abiens (Pic 1906).

flexed, a broadly concave area on either side of anterior half occupying one-third of width of disc and tapering posteriorly to posterior fourth leaving a thin reflexed margin; median depressed area extending from posterior edge to just short of anterior edge, posterior edge most deeply reflexed at center and just within angles, disc tumid on either side of posterior half. Elytra moderately stout, combined width one-fourth greater than thorax and nearly one-third of elytral length, longitudinal sculptured lines strong; short pubescence cinereous, erect hairs black. Anterior claw of protarsi cleft, outer cleft portion cultellate, slightly exceeding inner; apex obliquely arcuate; all others simple; first protarsal segment expanded, width equaling two-thirds its length, width of second equals three-fourths its length, width of third equals its length which equals width of second. Posterior margin of last ventral simple.

Male genital armature testaceous or dusky, dorsal bifurcation of tegmen very short, forks narrow, apices acute, widely divergent; median lobe stout, exceeding tegmen; lateral sinuations broadly lobular; ventral lobes laterally flattened at tips, moderately long (Fig. 1).

Female: Form slightly more robust, antennae shorter, not nearly reaching two-thirds body length, claws all simple, pro-tarsi not expanded. Width at base of elytra 2 mm., length 8 mm., antennae 5.5 mm.

Range: West Coast; Coastal California from San Diego north to San Francisco Bay region, San Mateo and Santa Cruz counties; northward along the coast from Marin county into Oregon and Washington.

Specimens examined (including the subspecies): 151.

This species was the earliest described representative of the subgenus and is herein designated the generic type. It is also of widest distribution and has two well developed subspecific variations. Its nearest relative appears to be *C. hatchi* but it is easily separated by the smaller eyes, maculate head and thorax, more robust form (eyes large, head and thorax pale, and form elongate in *hatchi*), and the absence of the coxal spur characteristic of the male in *hatchi*. *Americana*, particularly in the typical form, may show a low metacoxal ridge which seems to foreshadow the prominent spur of *hatchi*, but it can in no sense be said to be spurred. From *perpallens* this species is readily separated by the definite pronotal angles (anterior angles not evident in *perpallens*). In the Willamette Valley, Oregon, this species (subsp. *larvalis*) is usually associated with the Garry oak, *Quercus garryana* Dougl.

(To be continued in next issue.)

OBSERVATIONS ON THE MATING HABITS OF HALICTID BEES

(Hymenoptera: Apoidea)

BY GEORGE E. BOHART

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In October, 1946, on the experimental farm of the University of California, at Davis, rather large numbers of the following species of halictid bees were observed on the fermenting juice of broken watermelons: *Apis mellifera* L., *Agapostemon cockerelli* Crawford, *Halictus ligatus* Say, *H. farinosus* Smith, *H. rubicundus* Christ, and *Lasioglossum sp.* Except for the first, all belong to the family Halictidae. Since the mating of most genera of bees is not readily observed, the following notes are recorded.

Agapostemon cockerelli and *Halictus ligatus*, males and females, were the most abundant, and the males of both species spent most of their time trying to copulate with females. In these attempts the males flew in circles about 4 inches above the watermelons and dropped precipitously upon the feeding females after approaching them from behind. In most cases the females dislodged the males by simply taking flight or by first rolling onto their backs.

In approximately 5 percent of the encounters observed, mating was apparently successful. In such cases the male was seen to straddle the female with his head above her neck. The tip of his abdomen appeared to curl under and slightly to one side of the tip of hers, but this was not clearly observed. When full contact was made, the female crawled across the watermelon and in a few cases took flight for an inch or more. During this activity the male would usually lose hold with his fore- and mid-legs and assume an almost perpendicular position, still clinging to the female with his hind legs. The average time of contact was about 10 seconds. Mating was apparently terminated by the female, who dislodged the male by twisting, rolling over, thrusting with her legs, and then taking flight. The female, when free, immediately resumed feeding, and the male in most cases started searching for another female.

Little discrimination was shown by the males in selecting females for attempted matings. Females observed to be already mated were pounced upon as readily as the others, and females of all the halictid species, with the exception of the *Lasioglossum* which were very small, were subject to encounters by males of at least the three commonest species. In no case, however, was a male seen to make prolonged contact with a female known to be mated or with a female of a different species. Table 1 shows the results of a series of attempted matings observed in about half an hour on one watermelon.

Table 1.—Results of attempted mating by males of two species of Halictidae.[1].

	Agapostemon cockerelli	*Halictus ligatus*
Agapostemon cockerelli	32 A,[2] 3S	14 A
Halictus ligatus	6 A	36 A, 4S
Halictus farinosus	4 A	8 A
Halictus rubicundus	2 A	4 A
Lasioglossum sp.	—	1 A

[1]Observations were made by watching the females rather than the males.

[2]A = Attempted mating; S = apparently successful.

IXth International Congress of Entomology

The IXth International Congress of Entomology will be held from August 17th-24th, 1951, in Amsterdam (Netherlands). Entomologists wishing to receive in due course programs and application forms are requested to communicate with the Secretariate, c/o Physiologisch Laboratorium, 136 Rapenburgerstraat, Amsterdam. Further communications will follow in 1950.

Another European Weevil Established in California

A specimen of *Baris* (*Cosmobaris*) *scolopacea* Germ. was collected at Antioch, Calif., on July 15, 1946, by D. Giuliani. Mr. Peter Ting informs me that he has also collected this weevil at Corral Hollow, near Tracy, on cattails, May 4, 1939, and near Sacramento, June 25, 1949, on rag weed. Rag weed is its normal food plant.—Edwin C. Van Dyke.

PACIFIC COAST ENTOMOLOGICAL SOCIETY

G. F. Ferris	E. S. Ross	D. D. Jensen
Vice-President	*President*	*Secretary*

Proceedings

Two Hundred and Third Meeting

The two hundred and third meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on January 29, 1949, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ross in the chair. The following members were present: E. S. Ross, J. M. Watson, Victor Stombler, A. Retan, Ernestine B. Thurman, D. C. Thurman, F. X. Williams, Wm. D. Murray, K. D. Snyder, W. E. Hazeltine, C. H. Spitzer, J. W. Tilden, E. G. Wegenek, R. L. Doutt, H. B. Leech, R. S. Beal, Jr., K. E. Frick, F. H. Rindge, J. E. Gillaspy, E. C. Van Dyke, E. L. Kessel, N. W. Frazier, W. W. Middlekauff, N. D. Waters, C. P. Hoyt, B. E. White, H. H. Blakemore, W. H. Hart, J. du Bois, K. S. Hagen, J. G. Edwards, A. E. Michelbacher, S. H. Benedict, E. O. Essig, D. J. Gould, L. Quate, W. W. Wirth, P. D. Hurd, Jr., S. A. Sher, R. F. Smith, John Hart, and D. D. Jensen. The following visitors were also present: Ruth Ogren, Hal Brydon, Sherman L. Thomas, Sylvia R. Hindebrant, Claude Smith, Kathryn Hoyt, Mrs. F. X. Williams, J. W. Green, E. P. Cook, Jacques R. Helfer, J. H. Freitag, H. T. Osborn, Mrs. H. T. Osborn, and Bap Reddy.

The minutes of the previous meeting, held December 18, 1948, were read and approved.

The membership committee proposed and the Society elected Thomas W. Cook to membership in the Society.

President Ross appointed the following members as a committee to study the constitution and recommend amendments: Dr. Linsley (Chairman), Dr. Michelbacher, and Mr. Hurd.

In response to the president's call for notes, exhibits, and remarks, Mr. Hazeltine displayed 165 males and 3 females of *Pleocoma conjungens* Horn which were collected during the rain at Mt. Hermon.

Dr. Ray F. Smith described his recent visit to the site of some of Le Conte's collections during this early entomologist's trip west in 1867. Slides were shown of two important type localities which were formerly occupied by forts of the U. S. Army. Nothing is left of Fort Wallace near what is now Wallace, Kansas. A single tree stands on an uninhabited plain where the fort formerly

stood. Le Conte spent from June 24 to July 8, 1867, in this area. Portions of several hundred adobe buildings still stand as the remnants of Fort Union near Watrous, New Mexico. At the time of Le Conte's visit in August, 1867, Fort Union was the main supply point and headquarters for the lesser forts in the Southwest area.

Dr. Ross called attention to the fact that Dr. Duncan's presidential address given before the Society in 1947 on the subject: "Some Remarks on the Influence of Insects on Human Welfare", had been reprinted for distribution by the Smithsonian Institution.

President Ross then introduced as the main speaker of the day, Dr. Francis X. Williams, recently retired Entomologist of the Hawaiian Sugar Planters' Association Experiment Station, who spoke on the subject: "Notes on the Natural History of East Africa." Dr. Williams' summary of his remarks follows:

The Pacific Science Board of the National Research Council, on request from the United States Navy, sent me to Africa to study the habits and natural enemies of the giant African snail, (*Achatina fulica*) so destructive now on certain tropical Pacific islands.

Not being a malacologist, I first spent ten days at the Museum of Comparative Zoology at Harvard College, Cambridge, Massachusetts, to study some of the African land snails, under Dr. J. S. Bequaert, entomologist, malacologist, and botanist, and who is well acquainted with tropical Africa.

Mrs. F. X. Williams accompanied me to Africa. She took all the photographs and helped in many other ways.

Nearly all our transportation was by air. We arrived at Mombasa, Kenya Colony, British East Africa, early in December, 1947, and left Africa for the United States on June 19, 1948. In the search for a suitable headquarters for work on *Achatina* snails, we visited the Island of Zanzibar and a number of localities in Kenya Colony, Tanganyika Territory, and the Uganda Protectorate in the interior. Incidental to the work on snails, many other observations on natural history were made.

A very brief discussion of the faunal areas of the Ethiopian region followed; these included the Lower Guinea forest district, a wet area extending from the west into Uganda, some areas of Savannahs, the East African Highlands, and the East African Lowlands. The amount and annual distribution of the rainfall is the chief factor in determining these faunal areas.

The lake region in Uganda is briefly described, the Victoria Nile with its Murchison Falls roaring through a cleft less than 20 feet wide and flowing into Lake Albert, the wonderful macrofauna along its banks—dozens of hippopotami, elephants, water buck, baboons, etc., and large wading birds and fine fish eagles; elsewhere the quantities of lake fish (*Tilapia*), catfish, and lung fish caught overnight at a narrows, the huge marabou storks wait-

ing for the offal. Extensive swamps of the Egyptian bulrush (*Cyperus papyrus*), up to 15 or more feet tall, provide fine shelter for certain birds, etc. The elephant grass (*Pennisetum purpureum*) is much employed by the Africans in building their huts and fences.

On the highland plains, much large game was observed both from train and automobile; they included many antelope, giraffe, zebra, ostrich, and a small herd of buffalo. Secretary eagles were noted striding through the fields. Several kinds of weaver birds were observed nesting in colonies in palms and other trees. The preponderance and destructiveness of the Indian house crow (*Corvus splendens*), introduced into the Island of Zanzibar, was commented upon. The numerous beautiful species (Nectariniidae) of sunbirds, the males in metallic greens, reds, etc., remind us of our humming-birds, as they flutter among the flowers. Large birds of prey and horntails are conspicuous in many parts of Africa.

Among insects, at least a half dozen species of *Ampulex*, or cockroach wasps, were collected. The common *Ampulex compressa* was found in and about habitations. Many kinds of fossorial wasps were seen. Vespid wasps were well represented, large *Eumenes* and *Synagris* constructing their mud nests in buildings. There were fine species of carpenter bees (Xylocopidae) and the wild honeybee (*Apis* sp.), nesting in hollows of the huge baobab trees (*Andansonia digitata*), was very aggressive.

Several species of swallowtail butterflies were common in forest glades. Immense neuropterous insects of the genus *Palpares* flew up at your approach.

About Tanga, on the East African Coast, immense dark cylindrical millipedes that attained a length of at least 9 inches were common. Large millipedes play an important part hereabouts in the reduction of plant trash into humus.

As elsewhere in the tropics, termites are a problem here. Power poles and railroad ties are of metal, as a protection against termites and decay. Termites are also eaten with gusto *au naturelle* by Africans.

At the Diani Beach district on the Indian Ocean and but a few degrees south of the equator, most of the work on snails was carried on. Snails of the genus *Achatina* were very numerous here and reached a length of six inches.

In the Diani district the dry and wet seasons are sharply marked. It is interesting to note here how quickly the waterloving insects take advantage of rain puddles. Hardly have these formed when dragonflies begin ovipositing in them, and water and shore bugs appear almost by magic.

So brief a stay in Africa as ours makes us realize how little we know of the natural history of that vast continent.

After a discussion of the paper the meeting was adjourned.—D. D. JENSEN, *Secretary*.

Two Hundred and Fourth Meeting

The two hundred and fourth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on March 5, 1949, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ross in the chair. The following members were present: P. A. Adams, N. D. Waters, P. H. Arnaud, R. L. Doutt, K. S. Hagen, W. D. Murray, A. E. Pritchard, E. C. Van Dyke, R. P. Allen, D. W. Boddy, K. E. Frick, E. G. Wegenek, A. H. Retan, V. Stombler, H. M. Armitage, J. W. Tilden, H. H. Blakemore, K. W. Tucker, D. E. Bryan, V. M. Stern, T. W. Cook, W. W. Sampson, D. J. Raski, M. W. Allen, G. L. Smith, E. B. Thurman, D. C. Thurman, R. F. Fritz, D. Gould, J. E. Gillaspy, P. D. Hurd, Jr., E. G. Linsley, F. X. Williams, N. W. Frazier, J. W. MacSwain, R. van den Bosch, R. F. Smith, J. G. Edwards, W. C. Day, C. A. Hanson, E. E. Seibert, Larry Quate, A. E. Michelbacher, E. S. Ross and D. D. Jensen. Visitors were present as follows: Mrs. E. G. Wegenek, G. L. Stebbins, Alva Grant, Verne Grant, W. W. Allen, J. H. Freitag, C. B. Huffaker, R. W. Bunn, and Louisa Clark Williams.

The minutes of the previous meeting were read and approved.

The membership committee proposed the following for membership in the Society: R. A. Underhill, Kenneth R. Hobbs, K. W. Tucker, and R. W. Hunt. They were unanimously elected.

President Ross requested an expression of opinion from the members of the Society as to whether an informal luncheon should be held in a restaurant at noon before each meeting. After a brief discussion it was decided that such luncheons would be held for those who wish to attend them, but that members who wished to bring their own lunches would meet at the Academy.

President Ross appointed the following members as a committee to select a site for the annual field meeting of the Society which will be held in May: P. D. Hurd (Chairman), J. W. MacSwain, and Paul Arnaud.

In response to a call for notes, exhibits, and remarks, Dr. R. F. Smith reported that on January 26, 1945, at the Fabian Bell Tract near Tracy, California, a large colony of bees (*Exomalopsis* sp.) was found. When 786 cells were dissected out, 173 (22 per cent) were found to have been destroyed by mold, 19 (2.4 per cent) contained last instar bombyliid larvae, and 594 contained last instar bee larvae of which one-third had mold on them. Forty-one or 15.4 per cent of 267 *Exomalopsis* larvae had first instar *Rhipiphorus* larvae in them. These were full fed and occurred in the ventral portion of the thorax where they fed on the fat body of the bee larvae.

On February 15, 1949, at the Shiner Ranch east of Firebaugh, 33 per cent of the bee larvae examined contained *Rhipiphorus* larvae.

Dr. Smith stated that adults are rarely taken and at the present time the biology is known for no American species of *Rhipiphorus*.

Mr. H. B. Leach commented that in one day in British Columbia he had collected 40 specimens of a rhipiphorid species on goldenrod.

Mr. Armitage reported that when Dr. H. T. Osborn found the yellow clover weevil at Yreka, California, in 1948 it was thought to be the first record for the species in California. Since it was known to occur extensively in the eastern part of the United States, the records of some of the eastern collections were checked. In the Cornell University collection specimens were found which had been collected at Eureka, Pomona, and Los Angeles, California, as early as 1907. This case was cited as an illustration of the importance of museum insect collections for the economic entomologist. If these early collections had not been preserved as evidence that the species had existed in California for many years, a program might have been undertaken to determine its distribution in the state. Moreover, quarantine or eradication measures might have been invoked.

Dr. G. L. Stebbins, Professor of Genetics, University of California at Berkeley, was then called upon to present his address entitled, "Insects and Evolution." Professor Stebbins' discussion, which was illustrated with lantern slides, is summarized below.

Of the numerous problems in general evolution in connection with which evidence from insects is important, two have been selected for discussion, namely mimicry and the role of insects in the pollination of flowers. The personal experience of the speaker with mimicry began at the Hastings Natural History Reservation in Monterey County in 1944, where he observed the activity of the Sphingid moth, *Hemaris senta*, in pollinating the flowers of *Trichostema lanceolatum*, the turpentine weed. He was struck not only by the morphological resemblance of this moth to a bumble bee, but also by its similarity in behavior, and the fact that it flies by day, while its relatives are mostly night fliers. Such a combination of morphological characteristics and instincts must have been built up through a complicated process of mutation and genetic recombination guided by natural selection.

Two sets of experiments on mimicry were cited. The first, by P. J. Darlington, consisted in placing specimens of the genus *Thonalmus* (Lycidae, Coleoptera) as well as certain of its mimics in the family Cerambycidae, namely *Calocosmus venustus*, *Trichrous divisus*, *T. pilipennis*, and *Heterops dimidiata*, in cages along with the insect-eating lizard, *Anolis sagrei*. In two experiments, each lasting 5 days, the lizard failed to eat any of 4 specimens of *Thonalmus aulica* or of 7 specimens of mimicking species of Cerambycidae, but did eat all of 20 specimens of non-mimicking

species introduced into the cage, including 10 different plain-colored species of Cerambycidae.

The second set of data cited were those of E. B. Ford on the distribution of mimic, non-mimic, and imperfectly mimicking forms of the African butterfly, *Papilio dardanus*. This author showed that at Entebbe, where all of the aposematic, brilliantly colored model species are abundant, there is a relatively large number of different mimic forms of *P. dardanus*, while at Nairobi, where models are relatively uncommon and some are absent, the mimics are less abundant, and many of them are imperfect, due to the presence of genetic modifying factors. The simple Mendelian inheritance and consequently the genic basis of these mimic forms has been demonstrated by raising broods from gravid females collected in the wild, and observing the segregation of different mimic forms from these broods.

The first observations cited on flower pollination were those of K. Mather at the John Innes Horticultural Institution, Merton, England, on two species of snapdragon, *Antirrhinum majus* and *A. glutinosum*. *A. majus* is normally self pollinated but *A. glutinosum* is self incompatible and must be cross pollinated. Mather grew these two species in alternating plots in his garden, and found that of seeds gathered from *A. glutinosum*, only 2.9 per cent of hybrid plants were recovered, while seed gathered from *A. majus* gave only 0-1.2 percent of hybrids. Artificial cross pollination is successful between these two species as between two plants of the same species. Hence Mather's results can be explained only on the assumption that on a particular pollen collecting trip, the bees which pollinate these flowers remain true to one or the other species. Both species are pollinated by the honey bee, and it is possible that the same bee may visit *A. majus* on one pollen collecting trip and *A. glutinosum* on another, but bees which started their activity on one of the two species were observed to fly over the plots containing the second species in their search for more plants of the first species visited. Similar observations were made by Dr. Verne Grant on honey bees pollinating two different races of *Gilia capitata* cultivated in Berkeley.

The work of Pouyanne in North Africa, as cited by Ames, has shown that the orchid species *Orphrys fusca* and *O. lutea* are pollinated by male bees of the genus *Andrena*, through the process of pseudocopulation, while *Orphrys speculum* is pollinated by males of the wasp *Scolia ciliata* in a similar manner. The attitude of pseudocopulation is, however, different, since the *Andrena* species pollinate with their abdomens, and the *Scolia* with its head. The genus *Orphrys*, one of the most rich in species of the European flora, has undoubtedly been greatly stimulated in its evolution by the selective activity of the pollinating bees and wasps. Another example is the Australian orchid, *Cryptostylis leptochila*, which is pollinated by male flies of the genus *Lissopimpla*.

Grant has shown that in species of which the flowers are pollinated by Hymenoptera, Lepidoptera, or birds, a very large proportion of the characters used by taxonomists for differentiating species are based on the characters adapting them to insect pollination, namely the corolla, stamens, styles, and stigmas; while in those flowers pollinated by less discriminating insects, or by wind or water, a much smaller proportion of the valid taxonomic characters are found in these structures. In *Aristolochia*, however, a fly pollinated flower, the 250 species are differentiated largely on the basis of their tubular perianth, which is modified in different ways to form different types of fly traps. In *A. californica*, the perianth has its dark colored and transparent parts distributed in such a way as to make use of the fly's phototropism in guiding it into the location of the stigma and anthers.

Finally, the speaker speculated on the suggestion of Diels, that the earliest Angiosperms were pollinated by Coleoptera. In this connection it is notable that the herbaceous species of *Paeonia* native to the Old World are pollinated by bees, and have conspicuous white, pink, crimson, lavender, or yellow flowers, which are sometimes scented; while the two species native to the New World have dull brownish or maroon flowers, much smaller and inconspicuous, and without scent. Their pollinating agents are not known, but Delpino has reported that the shrubby species *P. suffruticosa* of China is pollinated by Cetoniae, which lick the fleshy disk at the base of the carpels. In this connection it is important to note that the disk of the American species, *P. Brownii* and *P. californica*, is the most highly developed of any species in the genus. In the Old World species, the disk is progressively reduced as the species become more advanced in their phylogenetic position. Since *Paeonia* is one of the most primitive genera of Angiosperms, the establishment of beetles as regular pollinators of primitive species of this genus would have great evolutionary significance.

After a discussion of the paper, the meeting was adjourned.—D. D. JENSEN, *Secretary*.

Two Hundred and Fifth Meeting

The two hundred and fifth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on April 2, 1949, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ross in the chair. The following members were present: E. L. Kessel, E. S. Ross, R. L. Doutt, B. Brookman, K. D. Snyder, N. D. Waters, E. O. Essig, A. E. Michelbacher, F. X. Williams, W. C. Day, E. C. Van Dyke, H. B. Leech, J. W. MacSwain, W. W. Wirth, P. D. Hurd, Jr., K. E. Frick, P. A.

Harvey, R. C. Miller, C. P. Hoyt, P. Arnaud, W. L. Hoyt, T. W. Cook, A. G. Applegarth, J. R. Walker, Ferne E. Atkins, C. I. Smith, R. F. Smith, R. E. Beer, R. van den Bosch, D. E. Bryan, E. G. Linsley, F. Leigh, K. S. Hagen, J. P. Gillaspy, and D. D. Jensen. The following visitors were also present: Mrs. Lucy M. Bryant, Owen Bryant, Edwin Cook, Al Landi, Donald L. Shuman, Hal W. Brydon, Kenneth F. Innes, Jr., William W. Allen and H. H. Abram.

The minutes of the meeting held March 5, 1949, were read and approved.

The membership committee proposed and the Society unanimously elected the following as members of the Society: Ediom F. Cook, Claude I. Smith, A. G. Applegarth, Owen Bryant, William L. Hoyt, Mrs. Ferne E. Atkins and Dr. Harold Elishewitz.

Mr. Hurd reported that Taylor State Park, in Marin County, had been selected by the field day committee as the site for the annual field meeting to be held May 8, 1949.

The president then called for notes, exhibits and remarks. Mr. Armitage reported that in March, 1949, the Federal Government had established a quarantine prohibiting the importation of Vanda orchids from the Territory of Hawaii. This was done because the Oriental fruit fly, *Dacus dorsalis* Hendel, had been found in the egg and larval stages on the flowers of this orchid. The larvae were found feeding on the petals. For some time this fly had been known to injure the flowers by means of its egg punctures.

Dr. Kessel exhibited an interesting mechanical fly trap used in the Orient to catch houseflies.

President Ross reported that on April 7, 1949, Dr. E. C. Van Dyke will celebrate his 80th birthday and extended to Dr. Van Dyke the congratulations, best wishes and appreciation of the Society for his long and distinguished service in the field of entomology and in the Society.

Mr. Owen Bryant was introduced and commented briefly on his experiences collecting insects in the Arctic region.

President Ross then introduced Dr. Richard L. Doutt, of the University of California, who spoke on the subject: "Polyembryony in the Parasitic Hymenoptera." Dr. Doutt's discussion, which was illustrated with lantern slides, is abstracted below.

Polyembryony refers to the production of two or more embryos from a single egg. This phenomenon is known to everyone in the cases of identical (monozygotic) human twins.

Experimental embryologists have artificially induced polyembryonic development in species typically monembryonic by isolating blastomeres. The natural occurrence of polyembryony may be either sporadic (human twins) or specific and the habitual mode of reproduction (Armadillos, certain parasitic Hymenoptera).

The most striking examples of polyembryonic development are found among the parasitic Hymenoptera. In this group there is

strong evidence that the development of polyembryony has undergone an evolutionary process.

Among the polyembryonic Encyrtidae it is suggested that polyembryony results primarily from a change in the cytoplasmic-nuclear balance of the egg cell when a polar region is formed from about half of the egg cytoplasm. This polar region gives rise to a protective envelope, the trophamnion, which ultimately constricts around each germ and effects its isolation. The abundant nutriment source provided by the host apparently stimulates development.

Peculiar, precocious, asexual larvae are produced from blastomeres which do not receive the germ cell determinant. The normal embryos in the polygerminal mass become intimately associated with the fat body and tracheae of the host.

A significant sexual differential in the amount of polyembryonic division exists in the Hymenoptera. This is explained by the influence of sperm nuclear material in fertilized eggs. This hypothesis is strengthened by results of radiation experiments in which androgenetic development was obtained.

After a discussion of Dr. Doutt's address, the meeting was adjourned.—D. D. JENSEN, *Secretary.*

Two Hundred and Sixth Meeting

The annual field meeting of the Pacific Coast Entomological Society was held at Taylor State Park, Marin County, California, May 8, 1949, and honored Dr. Edwin C. Van Dyke, charter member of the Society and one of its most active and distinguished members, for his 80th birthday which he celebrated April 7.

The recorded attendance was 73 persons, including 27 members, 20 adult visitors and 26 children. The following members were present: E. C. Van Dyke, E. S. Ross, H. B. Leach, E. O. Essig, W. W. Middlekauff, A. E. Michelbacher, M. W. Allen, D. P. Furman, A. E. Pritchard, R. F. Fritz, D. C. Thurman, E. B. Thurman, P. H. Arnaud, Jr., C. H. Spitzer, E. A. Smith, J. W. Tilden, M. Marquis, R. G. Wind, W. H. Lange, S. Dorman, F. P. Keen, N. W. Hazel, V. M. Stern, J. W. MacSwain, P. D. Hurd, Jr., J. E. Gillaspy, and D. D. Jensen. Visitors were present as follows: Mrs. E. S. Ross and daughter, Mrs. H. B. Leach and family, Mrs. Martha Michelbacher, Mrs. Marie Mauerhan, Mrs. M. W. Allen, Mrs. W. W. Middlekauff and family, Mrs. D. P. Furman and family, Sylvia R. Hildebrant, Mrs. E. A. Smith and family, Mrs. Marquis and family, Mrs. R. G. Wind, Mrs. W. H. Lange and family, Mrs. S. Dorman and family, Mrs. N. W. Hazel and family, Mrs. V. M. Stern, Mrs. J. W. MacSwain and family, Mrs. P. D. Hurd and family and Mrs. J. E. Gillaspy.

Although the region was wet from recent rains the day of the field meeting was generally fair. Some insect collecting was done along the stream and in the nearby hills but most of the time was spent in visiting and playing games.—D. D. JENSEN, *Secretary.*

Two Hundred and Seventh Meeting

The two hundred and seventh meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on October 29, 1949, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ross conducted the meeting. The following members were present: R. L. Usinger, G. F. Ferris, J .W. Tilden, P. H. Arnaud, F. X. Williams, C. P. Hoyt, J. W. MacSwain, R. W. L. Potts, R. C. Miller, K. D. Snyder, T. W. Cook, P. A. Adams, H. H. Blakemore, L. W. Quate, A. E. Pritchard, L. R. Gillogly, E. L. Kessell, Berta B. Kessel, Victor Stombler, Wm. Hazeltine, C. D. Duncan, J. G. Edwards, N. W. Frazier, K. S. Hagen, R. L. Doutt, E. C. Van Dyke, R. F. Smith, H. Elishewitz, K. F. Innes, Jr., C. W. Hildebrand, H. B. Leech, D. D. Jensen, and A. E. Michelbacher. The following visitors were present: James R. Loder, Sam E. Hall, Jr., M. D. Morris, R. W. Nicholls, F. P. Morishita, Barbara Hovanitz, William Hovanitz, E. A. Olson, D. R. Thomas, H. L. Thomas, J. G. Edwards, Jo Ann E. White, Don Wilton, Jerry Roberts and W. M. Hoskins.

The minutes of the meeting held April 2 and the minutes of the field meeting held May 8, 1949, were read and approved.

The membership committee proposed and the Society elected the following as members: Herbert H. Ross, C. Don MacNeil, Frank S. Morishita, Evert I. Schlinger, John N. Simons, Robert L. Sisson, C. W. Hildebrand, K. F. Innes, S. E. Hall, and Sherman L. Thomas.

President Ross appointed the following members to serve as a nominating committee to prepare a slate of proposed officers for 1950 to be elected at the next meeting: J. W. Tilden, Chairman, E. L. Kessel and E. G. Linsley.

The following were appointed by the president to audit the financial records of the Society and submit a report at the next meeting: Hugh B. Leech, Chairman, Paul Arnaud, Jr., and Paul Hurd.

Copies of a paper entitled "Embedding insects in plastic" by Wm. Hazeltine were distributed to the members present.

President Ross called on Dr. Usinger to comment on his activities while in Europe on sabbatical leave and where he served as the official representative of the Society at the 13th International Congress of Zoology at Paris during July and at the 8th International Congress of Entomology at Stockholm during August, 1948.

Dr. Usinger gave a brief report of the far reaching action taken by the International Commission on Zoological Nomenclature at the Paris meetings and mentioned some of the institutions he visited for entomological study.

The President then called on Professor Ferris who spent most of the past year in the Orient. Professor Ferris explained that he had been in China and Formosa most of the time where he made approximately 1000 collections of scale insects.

In response to a call for notes, exhibits and remarks Dr. Tilden exhibited specimens of *Oxygrillus ruginasus* (Lec.) (Scarabaeidae), which were causing damage to service stations in Arizona by digging in the asphalt between cement blocks, thus loosening the blocks. Dr. Tilden also displayed specimens of *Xylotrechus undulatus* (Say) (Cerambycidae) which emerged through the beechwood floor of his home in San Jose. They originated in coniferous wood beneath the beechwood floor.

Mr. Leech reported that last July his sons collected a wasp nest in Mill Valley. From the brood in the nest Mr. Leech reared out several hymenopterous parasites. One of the cells in the comb was opened October 28 and the pupa was still alive. Mr. Leech suggested that a diapause may explain the long survival of the wasp in the pupal state.

Dr. W. M. Hoskins, Professor of Entomology at the University of California, Berkeley, was introduced by the President and spoke on the subject: "The Significance of Chemosensory Responses to Insect Biology."

Dr. Hoskin's paper is summarized below.

There is general agreement that the choice of food by insects, as by man and animals, is strongly influenced by odors. However, gal 15—bug book—jan 1950 .... it has been claimed by some experimenters that the finding of mates from a distance, as in the case of the Oak Eggar moth studied by Fabre, cannot possibly be an attraction to an odor because of the great dilution of the odorous substance in diffusing to a distance of a mile or more. Calculation of the amount of a substance, e.g., skatol, which the human nose can detect at great dilution, shows that if insects are equally sensitive to the sexual attractions, then it is entirely possible for them to react to the odor coming from a distance. This assumption of equal sensitivity is substantiated by many tests which prove that man and many insects are roughly equally sensitive to a variety of odors and tastes and also are able to discriminate between similar substances with about equal accuracy.

A number of attempts to isolate and identify the compounds with which female insects attract males have not succeeded completely but in several instances, they appear to be complex alcohols. On the other hand, feeding attractants are very varied in nature. For example, wireworms are attracted to extremely low concentrations of various organic acids and amino acids, the Jap-

anese beetle comes to the terpene alcohols geraniol and eugenol, the Colorado Potato beetle to a complex phenotic compound accruing in potato leaves, the larvae of the cabbage butterflies to mustard oils, and tent caterpillars to the glucoside amygdalin.

The above examples illustrate the significant fact that food attractants are either useless nutritionally or present in too small amounts to be of any value as foodstuff. The insect finds food by reacting to them and hence they may be called "tokens." It has long been known that insects (and animals) may be trained to respond to artificial tokens. The effect generally is short lived, e.g., the honey bee continues to associate an essential oil with food for a few days only.

Egg laying on unnatural hosts is of frequent occurrence and this results in prolonged exposure of the resulting larvae to unnatural tokens. If they are able to mature on the new host and the cycle is repeated a few times, a new race conditioned to select this host may result. Thus psysiological races or even species may arise. It is interesting to note that sorting out of the resistant individuals in a community by using an insecticide is a phenomenon of the same type and results in several proven instances in the establishment of a new physiological race.

Dr. Hoskins' talk was followed by considerable discussion before the meeting was adjourned.—D. D. JENSEN, *Secretary*.

Two Hundred and Eighth Meeting

The two hundred and eighth meeting of the Pacific Coast Entomological Society was held at 2:00 p.m. on December 3, 1949, in the entomological laboratories of the California Academy of Sciences, San Francisco. President Ross in the chair. The following members were present: E. S. Ross, J. W. Green, E. L. Kessel, W. W. Middlekauff, A. E. Michelbacher, P. D. Hurd, Jr., R. F. Fritz, P. H. Arnaud, Jr., P. A. Adams, E. C. Van Dyke, J. R. Hart, J. W. MacSwain, F. X. Williams, W. C. Day, H. B. Leech, W. D. Murray, E. O. Essig, G. F. Ferris, E. A. Smith, Mrs. E. B. Thurman, D. C. Thurman, J. P. Harville, H. R. Greenfield, S. L. Thomas, T. W. Cook, R. F. Smith, R. L. Usinger, J. W. Tilden, R. W. L. Potts, W. W. Sampson, L. R. Gillogly, H. H. Blakemore, W. F. Barr, M. Marquis, A. M. Heimpel, D. W. Davis, K. D. Snyder, O. W. Graf, and D. D. Jensen, The following visitors were present: D. E. MacNeil, D. P. Wilton, and Galil Abul-Hab.

The minutes of the meeting held October 29, 1949, were read and approved.

The membership committee proposed and the Society elected the following as members: Donald W. Davis, A. M. Heimpel, Donald D. Linsdale, R. F. Stansbury, L. P. Coy, Otto W. Graf, Jr., and J. W. Green.

Dr. Usinger, representing the Nomenclature Committee, called the attention of the members present to the article, "Basic issues in the controversy on zoological nomenclature" which appeared in the December 2, 1949 issue of Science.

At the request of Dr. Linsley, Chairman of the special committee appointed to recommend amendments to the constitution of the Society, President Ross released Dr. Linsley as chairman and appointed Mr. Hurd to be the chairman. Dr. Linsley was retained as a member of the committee.

President Ross released Mr. Potts and himself from their temporary appointments as members of the nomenclature committee. They had served during the past year in the absence of Professor Ferris and Dr. Usinger, regular members of the committee.

The chairman announced that the term of appointment on the Publication Committee had expired for Dr. Duncan and Mr. Keiffer and they were released with a vote of thanks for their service over the many years. Dr. Kessel and Mr. H. B. Leech were appointed as the new members of the committee.

In response to a call for notes, remarks and exhibits, Mr. P. Adams exhibited a specimen of the Ithonid, *Oliarces clara* Banks together with representatives of the other North American families of Neuroptera. The Ithonid is the second of its family to be taken in the Western Hemisphere.

Mr. Gillogly exhibited a directory of South American naturalists.

Mrs. Ernestine B. Thurman reported the occurrence in California of an additional species of mosquito, *Aedes pullatus* (Coq.). Specimens were collected by Phyllis T. Johnson at Tuolumne Meadows, Yosemite National Park, on June 27, 1949. The determination was confirmed by C. M. Gjullin and W. W. Yates of the U.S. Bureau of Entomology and Plant Quarantine, Corvallis, Oregon. Details of the biology will be presented in a later paper.

Professor Ferris displayed illustrations of some of the curious scale insects which he collected in China.

The chairman appointed Dr. Middlekauff to be in charge of the Society's supply of surplus pamphlets and reprints which are available to the members at a low cost.

Dr. Tilden, representing the nominating committee, proposed and the Society elected the following officers for 1950: G. F. Ferris, President; R. L. Usinger, Vice President; D. D. Jensen, Secretary; and R. C. Miller, Treasurer.

The chairmanship of the meeting was turned over to the president-elect, Professor Ferris, who called on Dr. Ross to give his retiring presidential address entitled "The Role of the Entomological Museum." (This address appears in full in the present issue of the PAN-PACIFIC ENTOMOLOGIST.) After a discussion of the paper the meeting was adjourned.—D. D. JENSEN, *Secretary.*